HAMPTON VA

City of Hampton
BMP Effectiveness Study

Public Works
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BMP Effectiveness at the City of Hampton's Operation's Yard

NPDES stormwater permits have been instituted in order to achieve nitrogen, phosphorus and sediment reductions to meet Chesapeake Bay TMDLs. Reductions are satisfied primarily by extensive implementation of structural stormwater practices.

The City's operation's yard has instituted several BMPs and general good housekeeping principles aimed at reducing pollutant loading to the MS4. The first technique utilized includes installation of high capacity "FloGard" storm drain inserts which have been stationed at high impact areas. The inserts are designed to capture sediment in a basket at the bottom of the insert and hydrocarbon leachate within floating fossil rock pouches (diatomaceous earth).

Inspections are conducted regularly before and after rain events, and the FloGard inserts are cleaned and maintained on an as-needed basis, and in accordance with manufacturer's recommendations. Vacuuming loose debris is conducted regularly and fossil rock pouches are changed annually or more frequently as required. Fig. 1 illustrates the device as installed at the operation's yard. Maintenance specifications for the FloGard catch basin filter insert may be found in Appendix A.

Fig. 1. Illustration of FloGard insert installed at the operation's yard

The drainage areas for each catch basin insert and other BMPs at the site have been delineated and are provided in Appendix B. A summary of the areas are provided in the table below. Additional monthly inspections will take place at the location of each FloGard insert to determine if maintenance frequencies need to be adjusted.

Hampton Operations Facility Flogard Inserts

Drainage Area	Total Area (acre)	Pervious Area (acre)	Impervious Area (acre)	Installed
1	1.194	0.000	1.194	April 2013
2	0.722	0.014	0.708	April 2013
3	1.691	0.019	1.672	April 2013
4	1.572	0.015	1.557	April 2013
5	0.352	0.024	0.439	September 2016

Hampton Operations Facility HydroKleen Inserts

Drainage Area	Total Area (acre)	Pervious Area (acre)	Impervious Area (acre)	Installed
1	0.654	0.000	0.654	December 2016
2	0.777	0.000	0.777	December 2016
3	0.389	0.000	0.389	December 2016

Additional good housekeeping procedures:

- HydroKleen inserts have been installed at three locations, as shown in the table above. The HydroKleen inserts are an additional good housekeeping measure, and while they will be maintained on an as-needed basis, they are not part of the current effectiveness study.
- The location of existing oil/water separators will be evaluated for efficiency. Fluid levels will be checked regularly and pump-outs by certified waste hauler will be scheduled accordingly. Inspections will be conducted regularly to check for leaks and drips.
- Regular lot sweeping shall commence September 2016 (Figure 2a). Tons of sediment collected shall be recorded on a quarterly basis. Appendix C provides a SOP for sweeping practices at the yard and Lucity reports for street sweeping activities.
- Catch basin vacuuming shall continue to be conducted on as-needed basis. (Figure 2b)
- Employees will attend mandatory trainings in order to become informed on the BMPs installed within the site and maintenance practices thereof as well as to enforce the continuance of good housekeeping practices at the site. Furthermore, this management strategy will implement a series of practices geared towards reduction of waste generation. Employees shall be educated on various prevention pollution techniques and shall be re-trained periodically to keep current with regulatory requirements.
- Material storage and containment areas will be clearly marked. All hazardous materials shall continue to be stored in a safe manner.

- Accurate records shall be kept with respect to disposal of materials, inspections, and monitoring results.
- Dumpster signage will be utilized to enforce policies in order to keep rain water out and prevent trash from spilling out. Containment will be visually inspected periodically to determine if larger containers are needed or if the frequency of collection needs to be increased.

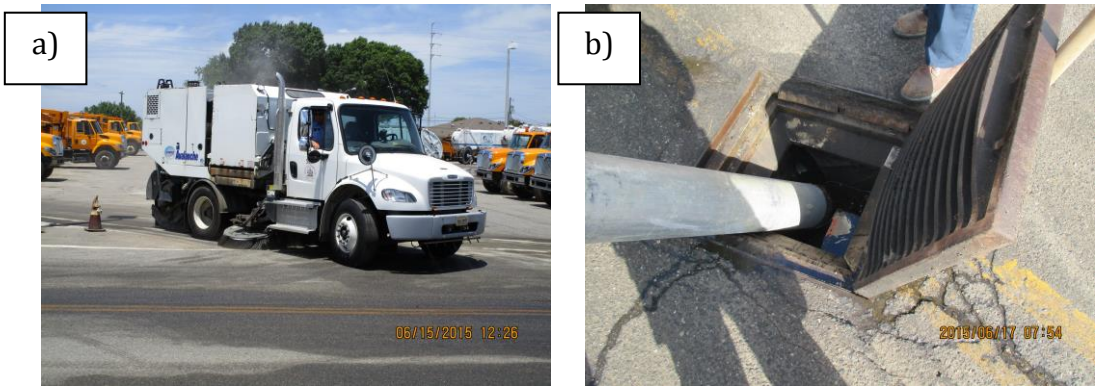


Fig. 2. Good housekeeping procedures conducted at the operation's yard; a) street sweeping and b) catch basin vacuuming.

BMP effectiveness will be determined based on sediment removal. Trends will be developed from several parameters including average monthly rainfall and sweeping. Appendix D provides ongoing results of the effectiveness study.

Appendices

Appendix A

FloGard ® + Plus
Catch Basin Filter Insert Specifications

GENERAL SPECIFICATIONS FOR MAINTENANCE OF *FLO-GARD+PLUS*® CATCH BASIN INSERT FILTERS

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed Flo-Gard+Plus® Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (washracks, parking garages, etc.): On a recurring basis (no less than three times per years).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing Flo-Gard+Plus® catch basin inserts.)
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc. shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary and the pouch tethers re-attached to the liner's D-ring. See below.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS:

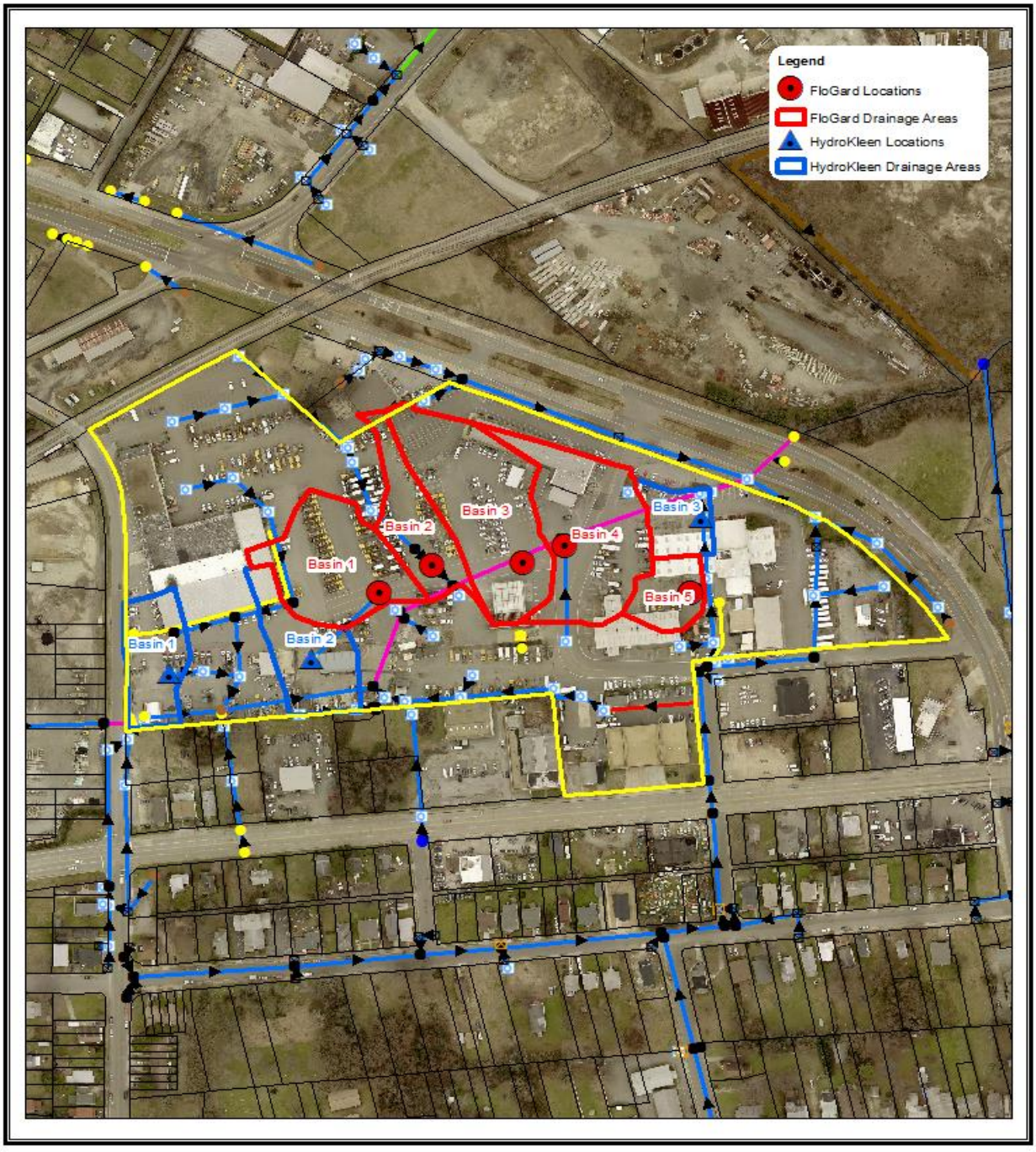
The frequency of filter medium pouch exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium pouches will be replaced with new pouches. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined space trained and certified. Call us at (888) 950-8826 for further information and assistance.

Appendix B

Map of Hampton Operations Facility Flogard Insert Drainage Areas

Appendix B - Basin Areas
550 N. Back River Rd.



Appendix C

SOP Maintenance and Cleaning

Stormwater
SOP – Maintenance and Cleaning

FLO-GARD+PLUS® CATCH BASIN INSERT FILTERS

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

The Stormwater department recommends that installed Flo-Gard+Plus® Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

MAINTENANCE DURING STUDY PERIODS

1. Pull grate remove insert. (Insert must be taken to the wash rack for weighing and cleaning.)
2. Remove hydrocarbon filter clipped inside the insert.
3. Remove sediment and debris into a bucket and weigh the bucket, subtract the weight of bucket and record weight.
4. Collect small sample for water content analysis
5. Dispose of sediment and debris appropriately
6. Pressure-wash lining of Flo-Gard insert and hydrocarbon filters.
7. Replace insert back in drop inlet.
8. Record all necessary information.

NORMAL SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing Flo-Gard+Plus® catch basin inserts.)
3. Pressure wash entire insert filter lining, including hydrocarbon insert filters.
4. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc. shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies affect the efficiency of the filter (torn liner, etc.).
5. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers shall be re-attached to the liner's D-ring.
6. Replace insert back in drop inlet.

Material Usage Summary Report

4/3/2017

PW Yard Sweeping Debris (lbs) from 9/1/2016 - 3/31/2017

12:44 PM

Material	UOM	Total Cost	Units	Avg Unit Cost
440-0405 Counter - PW Yard Sweeping Debris	Pounds	$0	6,068.28	$0
		$0	**6,068.28**	

Work Order Number: 16-012088

10/18/2016
8:21 AM

550 N BACK RIVER

Work Type: City

Category:	Streets	**Priority:**	High
Problem:	Maintenance	**Crew:**	Sweeper Crew
Cause:	Scheduled	**Supervisor:**	STEWART, WILLIAM K
Main Task:	Street Sweepers	**Status:**	Complete
Depth:		**Project:**	

Work Order Start Date/Time: 9/9/2016 **Work Order End Date/Time:** 9/9/2016

Location (s)

550 N BACK RIVER RD
419 N ARMISTEAD AVE
413 N ARMISTEAD AVE
231 SPRINGFIELD AVE

Comments for Crew

Sweeping of the Public Works Yard to include Fleet Services and Facilities

Task Start Date/Time: 9/9/2016 **Task End Date/Time:** 9/9/2016

Task Code: 440-0042 **Task Description:** Street Sweeping

Employee Name	Normal	OT
MCMURRAY, RANDALL D	7.50	0.00

Equip Code	Equipment Description	Hours
5048	CHALLENGER SWEEPER, STERLING	7.50

Contractor	Total Cost

Material Code	Material Description	Units
440-0405	Counter - PW Yard Sweeping Debris	780.00

Appendix D

BMP and good housekeeping activities results

DR6-4397 (1)									
Date	Sediment Depth (inches)	Average Preceding Monthly Rainfall (inches)	Antecendent Dry days	Date of last Cleaning	Insert Weight (lbs)	Moisture Content (%)[1]	Dry weight (wet sediment conversion)	P Removal (lbs)	N Removal (lbs)
9/26/2016	2	4.79	7			-		-	-
10/17/2016	4	3.47	9	9/18/2016	90.7	-	63.490	0.0762	0.7047
11/23/2016	10	1.10	9	10/17/2016		-		-	-
12/21/2016	16	1.86	3	11/23/2016	88.8	-	62.160	0.0746	0.6900
2/18/2017	16	3.52	39	12/21/2016	62.2	25	46.650	0.0560	0.5178
								-	-
								-	-
								-	-

DR6-4391 (2)									
Date	Sediment Depth	Average Preceding Monthly Rainfall	Antecendent Dry days	Date of last Cleaning	Insert Weight	Moisture Content (%)	Dry weight	P Removal	N Removal
9/26/2016	2.5	4.79	7				0.000	-	-
10/18/2016	3	3.47	9	9/18/2016	11.5		8.050	0.0097	0.0894
11/23/2016	2	1.10	9	10/17/2016			0.000	-	-
12/21/2016	12	1.86	3	11/23/2016	108.7		76.090	0.0913	0.8446
2/18/2017	3	3.52	39	12/21/2016	17.7	38.38383838	10.906	0.0131	0.1211
		0						-	-
		0						-	-
		0						-	-
		0							
		0							

DR6-4905 (3)									
Date	Sediment Depth	Average Preceding Monthly Rainfall	Antecendent Dry days	Date of last Cleaning	Insert Weight	Moisture Content (%)	Dry weight	P Removal	N Removal
9/26/2016	1.5	4.79	7				0.000	-	-
10/18/2016	2	3.47	9	9/18/2016	14.3		10.010	0.0120	0.1111
11/23/2016	1	1.10	9	10/17/2016			0.000	-	-
12/21/2016	5	1.86	3	11/23/2016	18.7		13.090	0.0157	0.1453
2/18/2017	5	3.52	39	12/21/2016	15.6	31.14754098	10.741	0.0129	0.1192
		0						-	-
		0						-	-
		0						-	-
		0							
		0							

DR6-4405 (4)									
Date	Sediment Depth	Average Preceding Monthly Rainfall	Antecendent Dry days	Date of last Cleaning	Insert Weight	Moisture Content (%)	Dry weight	P Removal	N Removal
9/26/2016	1	4.79	7				0.000	-	-
10/18/2016	2	3.47	9	9/18/2016	10.8		7.560	0.0091	0.0839
11/23/2016	7	1.10	9	10/17/2016			0.000	-	-
12/21/2016	12	1.86	3	11/23/2016	25.8		18.060	0.0217	0.2005
2/18/2017	2	3.52	39	12/21/2016	10.8	26.08695652	7.983	0.0096	0.0886
		0						-	-
		0						-	-
		0						-	-
		0							
		0							

DR6-4221 (5)									
Date	Sediment Depth	Average Preceding Monthly Rainfall	Antecendent Dry days	Date of last Cleaning	Insert Weight	Moisture Content (%)	Dry weight	P Removal	N Removal
9/26/2016	0	4.79	New insert*				0.000	-	-
10/18/2016	1	3.47					0.000	-	-
11/23/2016	1.75	1.10		10/17/2016			0.000	-	-
12/21/2016	5	1.86	3	11/23/2016	31.1		21.770	0.0261	0.2416
2/18/2017	3	3.52	39	12/21/2016	26.4	32.25806452	17.884	0.0215	0.1985
		0						-	-
		0						-	-
		0						-	-
		0							
		0							